

1. An isolated nucleic acid encoding a polypeptide comprising a subunit of a cation channel, the polypeptide:

- (i) forming, with at least one CNG alpha subunit, a cation channel having the characteristic of cyclic nucleotide-gating; and
- (ii) comprising an amino acid sequence having at least 95% sequence identity to SEQ ID NO:1.

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1 6. The nucleic acid of claim 1, wherein the nucleic acid selectively
2 hybridizes under moderately stringent hybridization conditions to a nucleic acid
3 comprising a nucleotide sequence of SEQ ID NO:2 or SEQ ID NO:3.

1 7. An isolated nucleic acid encoding a CNG2B polypeptide, the
2 nucleic acid specifically hybridizing under stringent conditions to a nucleic acid
3 comprising a nucleotide sequence of SEQ ID NO:2 or SEQ ID NO:3.

1 8. An isolated nucleic acid encoding a CNG2B polypeptide, the
2 nucleic acid comprising a nucleotide sequence having at least 90% sequence identity to
3 SEQ ID NO:2 or SEQ ID NO:3.

1 9. An isolated nucleic acid that specifically hybridizes under stringent
2 conditions to a nucleic acid encoding an amino acid sequence of SEQ ID NO:1.

1 10. A method of detecting a nucleic acid, the method comprising
2 contacting the nucleic acid with an isolated nucleic acid of claim 1.

1 11. An isolated polypeptide comprising a subunit of a cation channel,
2 the polypeptide:

3 (i) forming, with at least one CNG alpha subunit, a cation channel
4 having the characteristic of cyclic nucleotide-gating; and

5 (ii) comprising an amino acid sequence having at least 95% amino
6 acid sequence identity to SEQ ID NO:1.

1 12. The polypeptide of claim 11, wherein the polypeptide specifically
2 binds to antibodies generated against SEQ ID NO:1.

1 13. The polypeptide of claim 11, wherein the polypeptide has a
2 molecular weight of between about 61 kD to about 71 kD.

1 14. The polypeptide of claim 11, wherein the polypeptide has an amino
2 acid sequence of human CNG2B.

1 15. The polypeptide of claim 11, wherein the polypeptide has an amino
2 acid sequence of SEQ ID NO:1.

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1 16. The polypeptide of claim 11, wherein the polypeptide comprises an
2 alpha subunit of a heteromeric cyclic nucleotide-gated cation channel.

1 17. An antibody that specifically binds to the CNG2B polypeptide of
2 claim 11.

1 18. The antibody of claim 17, wherein the polypeptide to which the
2 antibody binds has an amino acid sequence of SEQ ID NO:1.

1 19. An expression vector comprising the nucleic acid of claim 1.

1 20. A host cell transfected with the vector of claim 19.

1 21. A method for identifying a compound that increases or decreases
2 ion flux through a cation channel, the method comprising the steps of:

3 (i) contacting the compound with a CNG2B polypeptide, the polypeptide
4 (a) forming, with at least one CNG alpha subunit, a cation channel
5 having the characteristic of cyclic nucleotide-gating; and
6 (b) comprising an amino acid sequence having at least 95%
7 sequence identity to SEQ ID NO:1; and

8 (ii) determining the functional effect of the compound upon the cation
9 channel.

1 22. The method of claim 21, wherein the functional effect is measured
2 *in vitro*.

1 23. The method of claim 22, wherein the functional effect is a physical
2 effect.

1 24. The method of claim 22, wherein the functional effect is
2 determined by measuring ligand binding to the channel.

1 25. The method of claim 22, wherein the functional effect is a chemical
2 effect.

1 26. The method of claim 21, wherein the polypeptide is expressed in a
2 eukaryotic host cell or cell membrane.

1 28. The method of claim 27, wherein the functional effect is
2 determined by measuring ligand binding to the channel.

1 29. The method of claim 26, wherein the functional effect is a chemical
2 effect.

1 30. The method of claim 29, wherein the functional effect is
2 determined by measuring ion flux, changes in ion concentrations, changes in current or
3 changes in voltage.

1 31. The method of claim 21, wherein the polypeptide is recombinant.

1 32. The method of claim 21, wherein the cation channel is
2 homomultimeric.

1 33. The method of claim 21, wherein the cation channel is
2 heteromultimeric.

1 34. The method of claim 21, wherein the polypeptide has an amino
2 acid sequence of SEQ ID NO:1.

1 35. A method for identifying a compound that increases or decreases
2 ion flux through a cyclic nucleotide-gated cation channel comprising a CNG2B
3 polypeptide, the method comprising the steps of:

(i) entering into a computer system an amino acid sequence of at least 100 amino acids of a CNG2B polypeptide or at least 300 nucleotides of a nucleic acid encoding the CNG2B polypeptide, the CNG2B polypeptide comprising an amino acid sequence at least 89% identical to SEQ ID NO:1;

8 (ii) generating a three-dimensional structure of the polypeptide encoded by
9 the amino acid sequence;

10 / (iii) generating a three-dimensional structure of the compound; and

(iv) comparing the three-dimensional structures of the polypeptide and the compound to determine whether or not the compound binds to the polypeptide.

1 36. A method of modulating ion flux through a CNG cation channel
2 comprising a CNG2B subunit to treat a disease in a subject, the method comprising the
3 step of administering to the subject a therapeutically effective amount of a compound
4 identified using the method of claim 21 or 35.

1 37. A method of detecting the presence of CNG2B in human tissue, the
2 method comprising the steps of:

- 3 (i) isolating a biological sample;
4 (ii) contacting the biological sample with a CNG2B-specific
5 reagent that selectively associates with CNG2B; and,
6 (iii) detecting the level of CNG2B-specific reagent that selectively
7 associates with the sample.

1 38. The method of claim 37, wherein the CNG2B-specific reagent is
2 selected from the group consisting of: CNG2B-specific antibodies, CNG2B-specific
3 oligonucleotide primers, and CNG2B-nucleic acid probes.

1 39. In a computer system, a method of screening for mutations of a
2 human CNG2B gene, the method comprising the steps of:

- 3 (i) entering into the computer a first nucleic acid sequence
4 encoding a CNG2B polypeptide having a nucleotide sequence of SEQ ID NO:2 or SEQ
5 ID NO:3, and conservatively modified versions thereof;
6 (ii) comparing the first nucleic acid sequence with a second nucleic
7 acid sequence having substantial identity to the first nucleic acid sequence; and
8 (iii) identifying nucleotide differences between the first and second
9 nucleic acid sequences.

10 40. The method of claim 39, wherein the second nucleic acid sequence
is associated with a disease state.